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AUTHOR Misanchuk, Earl R.; Shipley, Ken G.
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ABSTRACT

A survey was conducted to explore the potential of weekly newspapers for information dissemination in rural Saskatchewan. Articles about engineering research of relevance to the community had been mailed to eighty weekly Canadian newspapers on a free-choice basis over a ten month period. A random sample of 1,020 subscribers selected from the subscribers to three of the newspapers were sent a questionnaire asking them to indicate which of twelve articles they recalled seeing and, if so, read. The data obtained from 328 useable returns indicated that 53.2% of the sample reported either seeing the articles or reading some or most of them, while 42.8% of the sample reported not having seen the articles. After analyzing the popularity of the articles with the editors and readers and making some cost estimates, it was concluded that, assuming the current readership could be maintained, the weekly newspaper is a viable and efficient means of disseminating extension information of the type and for the purpose used in the engineering articles. (The questionnaire, copies of the twelve articles, and ten tables of data are appended.) (EM)

AN EVALUATION OF THE EFFICACY OF PUBLISHING ENGINEERING ARTICLES IN WEEKLY NEWSPAPERS IN SASKATCHEWAN

Extension Division
University of Saskatchewan
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Earl R. Misanchuk and Ken G. Shipley

BACKGROUND

An estimated 59% of Saskatchewan people live in small towns, villages, and rural areas of the province. The Saskatchewan Weekly Newspaper Association refers to this segment of the population as the "weekly newspaper market," and claims nearly 85% saturation of that market. More than half a million Saskatchewan people are exposed to weekly newspapers regularly.

In 1975 the College of Engineering expressed an interest in making the public of Saskatchewan more aware of the scope of activities at the College. In part, the College was concerned about its public "image," but its major aim was to find some means of informing the public about continuing research of relevance to the community at large. Thus the opportunity arose for the Extension Division to explore the potential of the medium of weekly newspapers for information dissemination.

Many of the research projects undertaken by the College are related to rural--and in particular, agricultural--concerns. Thus the College wanted to reach out to the farthest corner of the province with its information, and not restrict its reach to an identifiable client group or groups. Potentially, everyone in the province might be interested in what the College of Engineering had to say.

The breadth and diffuseness of the intended audience ruled out many of the more traditional approaches to extension education, such as direct contact through seminars or the use of direct-mail bulletins. Radio and television would have been obvious choices for this application, except for the prohibitive cost of production.

The use of weekly newspapers as a medium for such extension information had been tried elsewhere, especially for disseminating agricultural information (e.g., Ruffner, 1974; Sampson, 1973) with varying degrees of success. The relatively high degree of coverage of the Saskatchewan public claimed by the Saskatchewan Weekly Newspaper Association made the medium appealing for this particular application, and in 1975-76 the Division instituted a pilot project using short articles written by the College of Engineering faculty and distributed in camera-ready form to the eighty weeklies in Saskatchewan.

The project began with a visit to each department in the College to discuss the research of the department and the possibilities for short articles of public interest. Articles of 500-700 words were sought, with an accompanying photograph, if possible. The articles were edited under the auspices of the Extension Division, then sent to AdSask Agencies, a commercial house associated with the Saskatchewan Weekly Newspaper Association, for conversion to camera-ready copy.

The schedule worked out between the coordinator of the project and the potential authors called for the publication of an article in the series every fortnight from September, 1975 to June, 1976.

Articles were sent to the 80 weekly newspapers on a free-choice basis. That is, the editors were free to use the articles immediately upon receipt, or in a subsequent edition, or not at all. They were also free to change the format of the article, or to use only part of the article. A letter was sent to the editors with the initial article, introducing the series and asking for any comments or criticisms. There

was only one response, saying that the first article was quite suitable for inclusion in the newspaper.

Decisions had to be made about the choice of topics and the composition of the articles. Articles about research intended to solve practical Saskatchewan problems were expected to have most appeal. Agricultural topics were also expected to be popular. AdSask Agencies suggested that the articles would be more appealing to editors and readers if they were accompanied by a photograph, and that articles exceeding 700 words might not be well accepted, or might be shortened by the editors. It was difficult holding the authors to this length, and articles as long as 1,000 words were submitted.

In all of the articles the names of the researchers and their affiliation with the College of Engineering were mentioned. The articles concluded with an invitation to write for more information, and one article drew as many as 100 letters. This indicated that the public was responding well to the articles, but the data were not adequate to make serious decisions regarding the efficacy of the dissemination medium.

The need for a systematic evaluation of the efficacy of using the weekly newspaper as an extension medium was evident from the beginning. The project took a considerable investment of money and time. The camera-ready service cost about $300 per article, or $4,800 for the 16 articles. In addition, there was an investment of personal time in authorship, editing, and administration. Considering the objectives of the series, an evaluation was needed to answer the following questions:

1) Did subscribers actually read the articles?
2) Which articles were most popular with the readers and with the editors? Which were least popular?
3) How much did the inclusion or lack of a photograph affect acceptability?
4) How much did article length affect acceptability?
5) Did the College of Engineering gain more recognition through the series?

DESIGN OF THE EVALUATION

Scope of the Evaluation. During the deliberations regarding evaluation design, several important parameters to the project emerged. The first of these was that the thrust of the newspaper articles was more toward developing an awareness within the public of the activities of the College of Engineering than it was to teach the public substantive content. Thus an evaluation focussed on cognitive recall of information within the articles did not necessarily seem warranted.

A second consideration was that since the articles would be distributed to the weekly newspapers over a considerable span of time (some 10 months), and since some newspapers would print the articles immediately upon their release, while others would hold them and print them anywhere from one to several weeks later, recall of factual material would have to have been over an extremely long period of time. There is considerable research that indicates that by far the most forgetting of learned material occurs very shortly after learning. Recall of

factual material after nine or so months was therefore expected to be minimal.

The third factor of concern was that since there was essentially no means of controlling other possible sources of information available to potential respondents in the evalua ion, nor any possible means of eliminating pre-existing knowledge on the part of respondents (or developing adequate base-line data for it), any evaluation focussing on recall of content could not preclude the possibility of contamination from other information sources.

Taken together, these three considerations led to the conclusion that an evaluation geared to determining the amount of content recall of the engineering articles would not be advisable. Instead, a decision was made to be satisfied with data indicating recollection of the existence of the article. That is, the evaluation question to be asked was identified as being "Do you recall seeing these articles in your local weekly newspaper during the past nine months, and, if so, do you recall your reading some or all of each of them?"

It was felt that the answer to the above question would adequately represent the effectiveness of the attempt at developing awareness, while being feasible within the other constraints identified above. A mail survey of a random sample of weekly newspaper subscribers was selected as the optimal means of gathering the information.

Questionnaire Design. To maximize the potential for recognition, the decision was made to present copies of the articles themselves as part of the questionnaire. Thus the questionnaire was composed of a

booklet of reprints of the articles, and a separate response sheet on which respondents indicated their recollections of seeing and/or reading the articles (see Appendix A). The instructions accompanying the booklet and the response sheet indicated the purpose of the survey and the method of selection of the respondent, and urged the respondent to reply. A stamped, self-addressed envelope was provided.

In the booklet of reprints, every effort was made to have the reprints identical to the original camera-ready copy provided to the newspapers; however, format and length considerations necessitated cutting off parts of some of the articles. Where such truncation was necessary, an attempt was made to ensure that the remaining stimulus was adequate for recognition.

A quasi-random sample of articles was selected from those published up to the date of the initiation of the study. This resulted in 12 articles of the 14 released at the time the study was begun. The two articles eliminated were so treated only because the exact copy of the articles was not at hand. The twelve articles were randomly sequenced within the booklet.

On the response sheet, respondents were asked to indicate (for each article) by checking a box whether they could (a) not recall seeing the article in their weekly newspaper; (b) recall seeing it, but did not read any of it; (c) recall seeing it, and read some of it; or (d) recall seeing it, and read most or all of it. They were also asked to provide information regarding their sex, age, place of residence, and educational background. Furthermore, they were invited to provide

written responses if they so chose.

Sampling. A list of the weekly newspapers published in the Province of Saskatchewan was culled from the 1976 Canadian Advertising Rates and Data (C.A.R.D.), and six Saskatchewan weeklies were selected at random from that list. The publishers of those newspapers were contacted by telephone, and their cooperation in providing their mailing lists for the survey was solicited. The first three newspapers to indicate willingness to cooperate were used for the study. From the mailing lists of each of the three weeklies that cooperated, a systematic random sample of approximately 15% of the newspaper's published (C.A.R.D.) circulation was generated by selecting a random number to determine the first subscription list entry to become part of the sample, then taking every nth entry thereafter so that the 15% quota was reached at approximately the same time the subscription list was exhausted. In none of the three subscription lists was there any discernable systematic order. The survey was limited to only those subscribers resident in Saskatchewan.

This sampling procedure yielded 1,020 subscribers to whom questionnaires were mailed.

Returns. Questionnaire returns commenced within four days of the mailing of the questionnaire, and continued until 54 days after the date of mailing. A total of 328 useable returns (32.2%) were obtained.

ANALYSIS OF THE DATA

Preparation of the Data. Data were coded numerically and key-punched for computer analysis. For the questions regarding seeing and/or reading the articles, the responses were coded according to the following scheme: "I read all or most of the article" = 1; "I remember seeing the article, and I read some of it" = 2; "I remember seeing the article, but I didn't ready any of it" = 3; "I don't remember seeing the article" = 4.

Frequency tabulations and a number of other statistical analyses were done using the SPSS and University of Alberta Division of Educational Research Services packages of computer programs.

Inter-newspaper Variation. The ratios of questionnaires returned to questionnaires sent out agreed quite closely across the three newspapers--for Paper No. 1 it was 99/290; for Paper No. 2 it was 45/180; and for Paper No. 3 it was 184/550. To determine whether or not the differences in response frequencies were large enough to warrant differential weighting of results, a chi-square test was performed. The computed value of chi-square was 1.07, which was not statistically significant. Therefore no differential weighting was used.

Since the data came from subscribers to three different weekly newspapers, and there were obviously some differences in the response patterns to each article from one newspaper to the next (see the means, standard deviations, and percentages in each category for each article, for each newspaper, displayed in Appendix B), a check was done to

determine whether or not the response pattern to each of the twelve articles varied statistically from one newspaper to the next. Specifically, a two-way analysis of variance was performed to test the effect of affiliation with specific newspapers on the response distribution for each article (see Appendix C). The analysis indicated that newspaper affiliation was not a significant factor. On the other hand, there were statistically reliable differences among responses to the various articles ($F = 56.808$, $p < .0001$), indicating that some articles were read by more respondents than others. A statistically significant interaction effect ($F = 1.668$, $p < .03$) existed, but its magnitude was so small relative to the main effect, and its importance to the overall analysis so minimal, that for all practical purposes it could be ignored. These data indicate that for all practical purposes, the results for all three newspapers are similar enough that the data could legitimately be pooled for further analysis.

The demographic variables age, place of residence, number of years of schooling, and post-secondary education were also examined for inter-newspaper differences by performing one way analyses of variance. The latter two variables showed F ratios too small to exclude the possibility of chance variation ($\alpha = .05$), and while the former two did yield F ratios that were significant at the .05 level, subsequent Scheffe tests on both variables indicated that the means were not significantly different from one another (See Appendix D) A conservative interpretation of these data is that the differences in responses between the subscribers to the three different newspapers were not great enough to warrant considering newspaper affiliation as a

factor. Hence the results for all three newspapers were pooled for subsequent analyses.

RESULTS

Readership of Articles. The most basic question under consideration was "How many people reported seeing and/or reading the articles referred to in the survey?" Table 1 provides a numerical answer to this question.

Table 1 indicates a mean response to Article 1, "New Power Poles," of 2.899, with a standard deviation (S.D.) of 1.263. All or most of the article was reported as being read by 22.9% of the respondents; some of the article was reported as being read by 13.4% of the respondents; 10.7% of the respondents indicated that they did not read any of the article, although they recalled seeing it; and 49.4% reported not having seen the article at all. (The difference between the sum of those percentages and 100% is the proportion of non-respondents.)

Article 2 was entitled "Solar Heat for Grain Drying." The mean response was 2.484, (S.D. = 1.233), with 29.9% reporting having read all or most of the article, 21.0% reporting having read some of the article, and 14.3% reporting recalling the article, but not having read it. The percentage of respondents reporting not recalling seeing the article was 31.1.

"A Revolutionary Combine Design," the third article in the booklet, was reported as being completely or mostly read by 38.1% of the respondents, and partially read by 16.2%. Respondents recalling

Table 1

Article Readership Data
For All Newspapers (N = 328)

Item	Content	Mean	Standard Deviation	Valid N	Percentage of Respondents Indicating			
					Read all or most of the Article	Read Some of the Article	Saw, but didn't read the Article	Didn't see the Article
1	New Power Poles	2.899	1.263	316	22.9	13.4	10.7	49.4
2	Solar Heat for Grain Drying	2.484	1.233	316	29.9	21.0	14.3	31.1
3	Revolutionary Combine Design	2.361	1.291	316	38.1	16.2	11.3	30.8
4	Air Jets Shape Up	3.393	0.954	308	6.7	11.3	14.3	61.6
5	Indoor Atmosphere and Respiratory Health	2.798	1.247	317	22.0	20.7	8.8	45.1
6	Reduced Fuel Bills Using Solar Energy	2.378	1.231	315	32.6	23.2	11.6	28.7
7	100 Deaths Per Year, The Cost of Not Using Seat Belts	1.975	1.153	320	47.6	23.2	8.5	18.3
8	Energy Conservation in Existing Homes	2.489	1.267	311	30.5	21.0	9.8	33.5
9	Flood Control in Meandering Streams	3.345	1.039	313	10.1	10.4	11.6	63.4
10	Automatic Controls for the Combine	3.035	1.214	316	19.5	10.7	13.1	53.0
11	School Bus Safety--Is It A Problem	2.403	1.244	318	34.1	18.6	15.2	29.0
12	Minicomputers and Micro-Processors	3.497	0.932	312	7.0	8.2	10.4	69.5

the article, but reporting not having read it, represented 11.3% of the sample, while 30.8% of respondents reported not recalling the article. The mean response was 2.361 (S.D. = 1.291).

The mean response to "Air Jets Shape Up," the fourth article, was 3.393 (S.D. = 0.954). All or most of the article was reported as being read by 6.7% of the respondents; some of the article was reported as read by 11.3% of the respondents; 14.3% of the respondents indicated that they did not read any of the article although they recalled seeing it; and 61.6% reported not recalling seeing the article.

"The Indoor Atmosphere and Respiratory Health" was the title of the fifth article, and the mean response was 2.798 (S.D. = 1.247). Twenty-two percent of the respondents said they read all or most of the article, while 20.7% said that they had read some of the article. Recollection of the article, but not reading it, was reported by 8.8%, and 45.1% reported not recalling the article.

The sixth article was entitled "Reduced Fuel Bills Using Solar Energy"; it had a mean response of 2.378 (S.D. = 1,231). All or most of the article was reported as read by 32.6% of the respondents; some of the article was reported as being read by 23.2%; existence of the article was recalled by an additional 11.6%; 28.7% of the respondents reported not recalling seeing the article.

Article 7 was entitled "100 Deaths Per Year, The Cost of Not Using Safety Belts." The mean response was 1.975 (S.D. = 1.153), with 47.6% reporting having read all or most of the article, 23.2% reporting having read some of the article, and 8.5% of respondents reporting

recalling the article, but not having read it. The percentage of respondents reporting not recalling seeing the article was 18.3%.

The mean response to "Energy Conservation in Existing Houses," the eighth article, was 2.489 (S.D. = 1.267). Thirty and one-half percent of the respondents reported having read all or most of the article, 21.0% reported having read some of it, 9.8% reported recalling seeing the article, but not reading it, and 33.5% reported not recalling seeing it.

The ninth article, "Flood Control in Meandering Streams," had a mean response of 3.345 (S.D. = 1.039). All or most of the article was reported as having been read by 10.1% of the respondents, while 10.4% reported having read some of the article. The percentage of respondents indicating that they recalled seeing the article, but didn't read it, was 11.6, and 63. % said that they did not recall seeing the article.

Article 10, "Automatic Controls for the Combine," was reported as completely or mostly read by 19.5%, recalled and partly read by 10.7%, recalled but not read by 13.1%, and not recalled by 53.0%. The mean response to Article 10 was 3.035 (S.D. = 1.214).

The eleventh article, "School Bus Safety--Is It a Problem?," had a mean response of 2.403 (S.D. = 1.244). All or most of the article was reported as read by 34.1%, and some of the article was reported as read by 18.6%, while 15.2% reported remembering seeing the article, but not having read it. Twenty-nine percent indicated they could not recall seeing the article.

The final article, "Minicomputers and Microprocessors," had a

mean response of 3.497 (S.D. = 0.932). Seven percent of the respondents indicated that they had read most or all of the article, and 8.2% indicated they had read some of the article. The respondents who recalled seeing the article but not reading it made up 10.4% of the sample, and 69.5% reported not recalling the article.

If one sums across all twelve articles sampled, to get an average estimate of recognition and readership of the articles, one gets an average response of 2.754, with a mean standard deviation of 1.172. The percentage of respondents indicating that they read all or most of the articles was 25.1, while an additional 16.5% indicated that they had read some of the articles. Together, this group of people who said that they read some, most or all of the article comprises 41.6% of the sample. Additionally, 11.6% of the respondents indicated that they recalled seeing the articles although they didn't read them. Therefore, 53.2% of the sample reported either seeing the articles or reading some or most of them, while 42.8% of the sample reported not having seen the articles.

Demographic Data. The demographic data derived from the survey are described completely in the table in Appendix E. Briefly, the findings were that approximately one-third of the respondents were male, and just under two-thirds of the respondents were female; that the ages of the readers were approximately evenly distributed across the the 20-60 year age range, with a slight increase in numbers in the higher ages; that a little more than one-third of the respondents lived on a farm, while about one-fifth lived in a town of less than 500, one-tenth

lived in a town of size 500 - 1,000, and another one-third lived in a town over 1,000. With respect to schooling, about one-tenth of the respondents completed grade seven or less, nearly one-fifth completed grade eight, and another one-fifth completed grades nine and ten. More than one-third completed grade twelve. Ten percent of the respondents completed one year of post-secondary education, and nearly as many completed two years.

Write-in Comments. Write-in comments were examined and classified into several categories for ease in tabulation. Sixty-three persons (19.5%) wrote in general comments that varied widely in their content, while 24 (7.3%) included their names with or without additional messages. Twenty-nine people (8.8%) wrote comments stating, in effect, that they weren't sure that they had seen the articles in the particular paper described in the questionnaire package, since they received more than one weekly newspaper. In total, 87 people (26.5%) wrote comments of one kind or another. (Some of them are counted more than once in the categories listed above, since they made more than one kind of comment.)

Popularity of Articles with Editors and Readers. AdSask Agencies, which provides camera-ready copy to all weekly newspapers in the province also monitors the pick-up rate of such copy. The information available was in three categories: which newspapers were provided with the camera-ready copy; which newspapers included the copy in question in the issue immediately following receipt of the copy; and which newspapers included the copy in question at some later date. Thus we are able to compute the percentage of newspapers which ran the copy immediately, the

percentage of newspapers which ran the copy on a delayed basis, and, by subtraction of the sum of those two from 100%, the percentage of newspapers which did not run the copy at all.

Because the full reporting service was not in operation throughout the term of the survey, pick-up data are not available on two of the articles included in the survey. However, data are available on two articles published after the survey was undertaken, and these data are included in the appropriate portions of the analysis which follows.

As can be seen from Table 2, the total pick-up rate ranged from 40% to 87%, with an average total pick-up across 12 articles of 71.7%. Immediate pick-up ranged from 22% to 47%, with an average of 39.8%. These values compare very favorably with the only comparable data we were able to locate--Sampson (1973) reported an apparent pick-up rate of 25-50% on camera-ready agricultural extension information.

A rule of thumb that seems to be widely used in the publishing industry is that readers are attracted to articles accompanied by pictures. However, at least one study (Ruffner, 1974) did not find evidence to support this generalization, and it was decided to determine in this study whether or not there was a relationship between the existence of pictures with the articles and the frequency with which editors picked up the articles, as well as between the existence of pictures with the articles and the degree to which readers actually read the articles. To that end, correlation coefficients were computed between various pairs of the pick-up rates, readership indices, and the existence of pictures (see Table 3). There is a significant relation-

Table 2

Pick-up Frequency as Related to Article Attributes[1]

Article #	Publication Sequence	Pick-up Rate by Editors (%)			Length[2]	Picture[3]	Readership[4]
		Total	Immediate	Late			
1	7	82	35	47	3888	1	36.3
2	1	81	48	33	3645	1	50.9
3	2	73	36	37	3024	1	54.3
4	11	--	--	--	4617	1	18.0
5	9	70	23	47	3888	0	42.7
6	5	75	30	45	4455	1	55.8
7	6	87	50	37	4446	1	70.8
8	4	80	34	46	6003	1	51.5
9	14	--	--	--	3726	1	20.5
10	3	40	18	22	3276	0	30.2
11	10	75	34	41	3528	1	52.7
12	8	73	30	43	4116	0	15.2
X	15	68	25	43	3600	0	----
Y	16	56	19	37	4698	0	----

[1] pick-up frequency data were not available for articles 4 and 9; articles X and Y did not form part of the survey, so readership data are not available for them.

[2] estimated in characters

[3] 1 = picture accompanied article; 0 = no picture accompanied article

[4] estimate obtained by adding percentage of people who read all or most of the article to the percentage of people who read some of the article (see Table 1)

ship between the immediate pick-up rate and the existence of a picture but not between the late pick-up rate and the existence of a picture. Nor was there a significant correlation between the rate of readership and the existence of a picture. Thus the data from this study, which point in the same direction as those found by Ruffner, indicate that while the editors appear to be influenced by the existence of a picture (as reflected by their pick-up rate), the readership is not. Perhaps the editors have learned the rule of thumb better than the reading public! In any case, the results of these two studies appear to suggest that editors may be unwarranted in their actions of selecting stories accompanied by pictures, especially if their prime motivation for doing so is to attract readership.

Another rule of thumb indicates that shorter articles are more likely to be picked up by editors, and more likely to be read by readers. Ruffner found that both editors and readers said that they preferred shorter articles to longer ones. To check for relationships between length of articles and pick-up rate or readership, correlation coefficients similar to those described above were computed (see Table 3). The data from this study showed that there is no relationship between length of article and either pick-up rate or readership.

To investigate the possibility that either pick-up rate or readership was related to the sequence in which the articles were sent out to newspapers, correlation coefficients were computed between publication sequence and pick-up rates and readership (see Table 3). No relationship between publication sequence and either pick-up rate or readership was

Table 3

Correlation of Article Characteristics With Pick-Up Rate and Readership

Characteristic	Pick-up Rate			Readership
	Immediate	Delayed	Total	
Existence of picture[1]	0.77***	0.17	0.71***	0.40
Length of article[2]	0.06	0.42	0.28	0.10
Publication sequence[3]	0.40	-0.22	0.31	0.24

[1] Point-biserial correlations

[2] Pearson product-moment correlations

[3] Kendall's τ correlations

*** $p < .005$

found.

A factor analysis was done to determine whether the subject matter of the articles related to their popularity. The results of the principal components analysis with iterations, and varimax rotation, are supplied in Appendix F. In brief, the factor analysis indicated that there were three major groups of articles; the first group consisted of the articles "The Indoor Atmosphere and Respiratory Health," "Reduced Fuel Bills Using Solar Energy," "100 Deaths Per Year, the Cost of Not Using Safety Belts," "Energy Conservation in Existing Houses," and "School Bus Safety--Is It A Problem?"; the second group consisted of the articles "New Power Poles," "Solar Heat for Grain Drying," "A Revolutionary Combine Design," and "Automatic Controls for the Combine"; and the third group consisted of the articles "Air Jets Shape Up," "Flood Control in Meandering Streams," and "Minicomputers and Microprocessors."

The correlations in Table 3 suggest that the clustering portrayed by the factor analysis was apparently not the result of either the sequence of presentation of the articles, the length of the articles, or the existence of pictures accompanying the articles. It was therefore concluded that the clustering was probably a result of the content implied by the headline for each article.

Using the headlines as a guide, it is possible to examine the results of the factor analysis for implications regarding the popularity of various content. The first factor grouping appears to revolve around concerns for safety, economy, and health--a kind of person-oriented consumer concern. The second factor grouping appears to be oriented

toward a different level of consumerism, one which relates to technological advances in very practical, day-to-day matters --the research intended to solve practical Saskatchewan problems, that the project planners expected to have much appeal. The third factor grouping appears to relate to more esoteric technological advances.

When one examines the ranking of popularity of the articles comprising each factor grouping, one finds that the average rank of the articles in the first factor grouping is 4, that of the second grouping is 6, and that of the third grouping is 11.

Thus there seems some evidence (although not so much that it should be overinterpreted) that articles dealing with person-oriented consumer concerns and articles describing technological advances of a clearly practical nature were better received than were articles dealing with more esoteric information regarding technological advances.

This is not to say that in future efforts, attention should be given only to articles dealing with consumer-oriented questions, at the expense of those dealing with more arcane technology. There is merit to the argument that one of the legitimate functions of a university extension effort such as the engineering article series is to educate the public on a broad variety of matters. If, however, the purpose of the effort is primarily to get the reader to read the article, it would seem that there does seem to be a hierarchy of content in terms of effectiveness to that end.

Of course, it should always be remembered that the twelve articles used in this study do not by any means represent the whole range of

possible subject-matter for newspaper articles, and that therefore it is quite possible that a whole domain of even more popular subject matter (which has not yet been tapped by the series) does exist.

IMPLICATIONS OF THE FINDINGS

Some data obtained in earlier studies will help to put the findings of the present study into perspective. A report for the Saskatchewan Weekly Newspaper Association, completed recently (1976) by Communications Management, Ltd., points out that for Saskatchewan the weekly newspaper circulation total exceeds the daily newspaper circulation total by a ratio of about 4 to 3 (173,500 to 128,000). For 1975, this meant that weekly newspapers were received in 156,198 households throughout the province, thereby reaching some 547,453 people. The report also points out that only 38% of the province's population resides in the four largest cities. An earlier report (1974) by Marketing Insight, Ltd., showed that 68.3% of Saskatchewan farmers received weekly newspapers (as opposed to 31.8% receiving dailies), and that 64.3% of Saskatchewan farmers regularly read one or more weekly newspapers (as opposed to 16.9% for dailies). Taken together, these data indicate that the weekly newspaper holds much potential for reaching the populace of Saskatchewan with extension information.

Extrapolating the data gathered in this survey to the data described in this report, one could estimate the number of people actually reading each of the articles in the series (see Table 4). While recognizing that there is some error of measurement involved in the

survey process, one could still place a fair degree of confidence in the estimates. The estimate indicate that even the least popular article of the series ("Minicomputers and Microprocessors") was remembered as having been seen by some 56,935 people. Adding in the people who indicated that they had read some of the article, the estimate rises to 101,826 (for the least popular article in the series) to 173,543 (for the most popular article, "100 Deaths Per Year, The Cost of Not Using Safety Belts"). Finally, adding to these categories of readership the one which indicates that the respondent read most or all of the article, the estimated readership figures vary from 140,147 for the least popular article to 434,130 for the most popular article.

In these terms, at the current cost to the University of approximately $300 per article insertion (excluding writing and administrative costs), the cost per "reader" (defined as a person who at least remembers seeing an article, or who has read part or all of it) for each article in the series was probably between 7/100¢ and 1/5¢. If writing and administrative costs are added in, the cost per reader i probably between 1/10¢ and 3/10¢.

The costs quoted above may be a little deflated--quite a number of survey respondents indicated that they received more than one weekly newspaper, and that they couldn't be certain that they had seen the particular article in the particular paper described in the survey. While this observation doesn't really invalidate the cost estimates above (since, in a cost per exposure calculation, one need not be concerned exactly where the exposure occurred, only that it occurred at all), it

Table 4

Estimated Numbers of Readers of
Engineering Articles in Saskatchewan

Article	Response Category (cumulated)		
	Saw, but didn't read	+ Read some	+ Read all or most
Least Popular	56,935	101,826	140,147
Average	63,505	153,834	291,245
Most Popular	46,534	173,543	434,130

does indicate that there may be a small amount of error involved in the estimate in addition to the normal amount of error involved in a survey. Still, it would be very surprising if such additional error exceeded ten percent.

In this light, assuming the current readership frequency could be maintained, the weekly newspaper would appear to be a viable and efficient means of disseminating extension information of the type and for the purpose used in the engineering articles series.

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APPENDIX A

QUESTIONNAIRE

UNIVERSITY OF SASKATCHEWAN SASKATOON, CANADA
S7N 0W0

June 7, 1976

Dear Person;

The Extension Division of the University of Saskatchewan is conducting a survey to find out how effective the weekly newspaper is for distributing extension information.

You have been selected, as one of the readers of the Kelvington Radio, to respond to a short, simple questionnaire. It will take less than 5 minutes for you to fill out the questionnaire. It is very important that you return the questionnaire promptly--today would be best.

You may fill out the questionnaire yourself, or you may give it to another member of the family who regularly reads the Kelvington Radio.

Remember, it is important that you mail back the questionnaire promptly; use the self-addressed, stamped envelope. Thank you for your assistance.

Sincerely,

L. Misanchuk

Earl Misanchuk
Associate Professor
of Extension

EM:bjp
Enclosure

EXTENSION
DIVISION

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY BEFORE COMPLETING THE PINK QUESTIONNAIRE ATTACHED.

1. On the stapled pages enclosed are reproduced some short articles that appeared in your weekly newspaper, the Kelvington Radio, sometime during the past nine months. You are being asked to look at each article and to decide whether or not you have seen it in the Radio.

2. PLEASE DO NOT READ THE ARTICLES AS YOU ANSWER THE QUESTIONNAIRE. There is no need for you to actually read the articles--simply indicate whether or not you have previously seen or read them. After you have answered the questionnaire, you may read the articles if you wish.

3. Answer the questionnaire by placing a mark in the square that corresponds to your answer, for each article. You will notice that the questionnaire is on a separate sheet, and contains a collection of article numbers and boxes. Each article is numbered, in the stapled booklet, and each article corresponds to a line on the questionnaire form. Each box, of course, corresponds to one of the four possible answers written at the top of each column.

4. FOR EXAMPLE, if you looked at article number 7 in the stapled booklet, and you decided that you remember seeing the article in the Radio, but you did not read it, you would mark the following on the questionnaire form:

	I don't remember seeing the article	I remember seeing the article, but I didn't read any of it	I remember seeing the article, and I read some of it	I read all or most of the article
ARTICLE 7	☐	☒	☐	☐

5. Answer the questions about yourself in the space labelled RESPONDENT INFORMATION by either checking the appropriate box or by filling in the blank.

6. If you would like to write any additional comments, please do so on the back of the questionnaire.

7. Place the completed questionnaire in the stamped, self-addressed envelope and mail it. You may keep the articles--please do not return them.

IT IS IMPORTANT THAT YOU RETURN THE COMPLETED QUESTIONNAIRE PROMPTLY.

QUESTIONNAIRE

Please read the instructions on the previous page, if you haven't already done so, then fill out this form by checking the appropriate boxes.

	I don't remember seeing the article	I remember seeing the article, but I didn't read any of it	I remember seeing the article, and I read some of it	I read all or most of the article
ARTICLE 1	☐	☐	☐	☐
ARTICLE 2	☐	☐	☐	☐
ARTICLE 3	☐	☐	☐	☐
ARTICLE 4	☐	☐	☐	☐
ARTICLE 5	☐	☐	☐	☐
ARTICLE 6	☐	☐	☐	☐
ARTICLE 7	☐	☐	☐	☐
ARTICLE 8	☐	☐	☐	☐
ARTICLE 9	☐	☐	☐	☐
ARTICLE 10	☐	☐	☐	☐
ARTICLE 11	☐	☐	☐	☐
ARTICLE 12	☐	☐	☐	☐

RESPONDENT INFORMATION (Check the appropriate boxes and fill in the blanks)

Sex: ☐ Female ☐ Male

Age: ☐ under 20 ☐ 21-30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐ over 60

Place of Residence: ☐ farm
☐ town of less than 500 people
☐ town of 501 - 1000 people
☐ town of more than 1000 people

Education: Highest grade completed in school _____

Number of years of university, college, or other post-high school education, if any _____

You may write any comments you wish on the back of this page. Please return this questionnaire promptly in the enclosed stamped, self-addressed envelope. DO NOT return the articles. Thank you for your assistance.

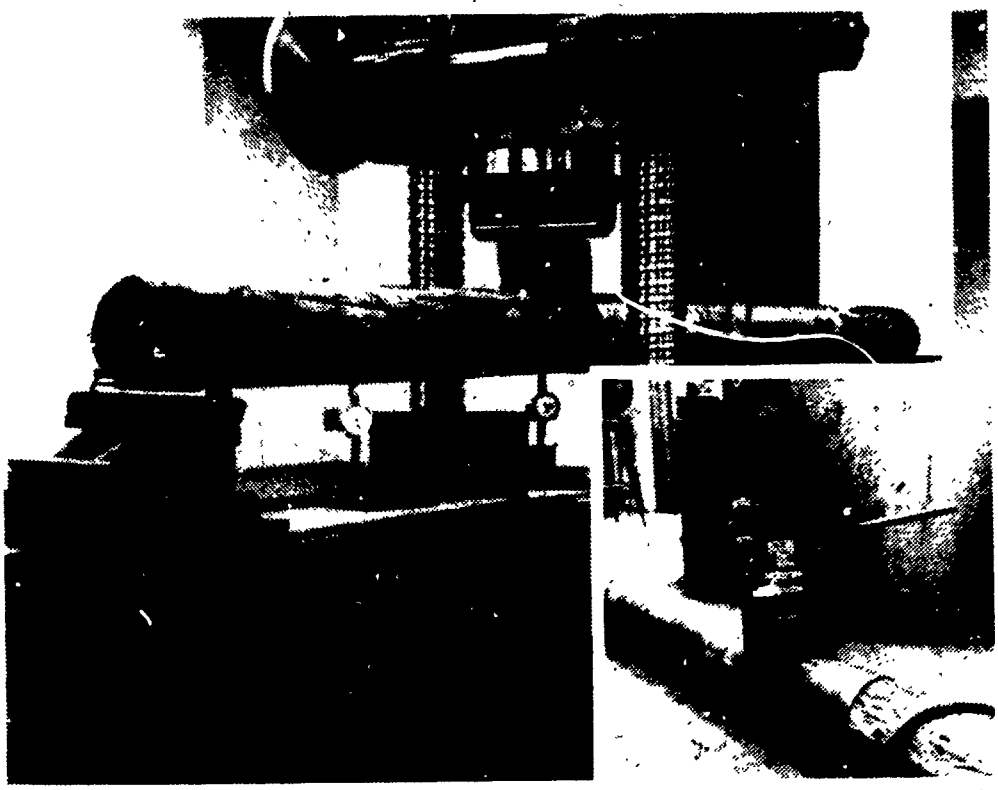


Photo shows the welded cylindrical sleeve used to splice the two pine logs together, which creates a taller power pole. Insert photo shows the hydraulic compression apparatus used to install the steel sleeve.

New Power Poles

By Dr. M. U. Hosain

Saskatchewan is now spending millions of dollars each year on power poles. Most of our poles are bought from British Columbia and Oregon, and shortages have caused costs to rise. Last year, the University of Saskatchewan's Civil Engineering department began research to find locally available materials which could be used for such poles and so would save money for prairie power utilities.

Two types of poles are used in power transmission and distribution. For transmission poles 65 feet and over, the power utilities have preferred to use cedar available mainly from British Columbia and Oregon. For the smaller distribution poles, 35 to 45 feet, utilities have often used prairie jack pine. But continuous harvesting has diminished these stands on the prairies and the utilities have had to order these poles also from B.C. In recent years both types of poles have been in short supply and this year B.C. Hydro itself is using hollow concrete poles on trial basis.

The [illegible] and the Saskatchewan Forest Products Corporation.

The preliminary investigation suggested that concrete and local wood are the most suitable and economic materials for power poles to be found in Saskatchewan. Some years ago, Ontario Hydro began using hollow spun-cast or pre-stressed concrete poles, so using similar poles here would be a speedy solution. However, concrete poles weigh three times as much as wooden ones and presently cost much more. The investigators decided to concentrate on finding a suitable Saskatchewan wood.

Height is one of the prime considerations in choosing a native tree, and white spruce of the right dimensions is readily available in Saskatchewan. It is strong enough, but does not respond well to perservative treatments. The Forest Product Laboratories in Ottawa are presently investigating this problem. If a perservative treatment is found, Saskatchewan will be assured of an abundant supply of [illegible] poles.

[illegible] 35 feet [illegible] size.

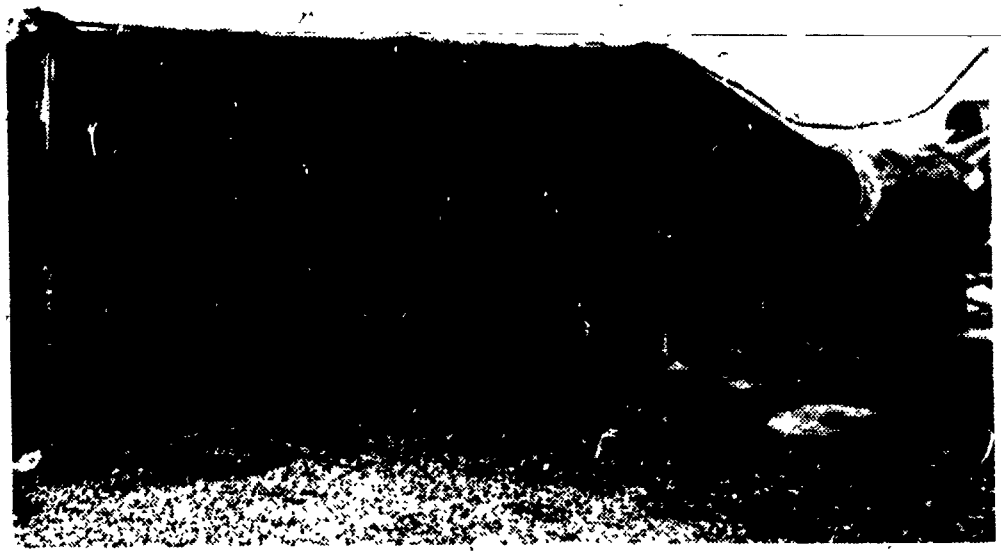
the desirable qualities. The team built a hydraulic compression apparatus to install the steel sleeve.

The second design concept was simply strapping several logs together to build a higher pole. The tests conducted so far show that these poles sway too much and break easily. Further tests using improved designs are planned.

Constructing a frame of several logs is another approach to the problem. The investigators have structurally analysed several designs and have conducted tests to determine the load capacity of the connections required. This type of frame requires a wider right-of-way, but this is not an important cost factor in rural areas.

The fourth concept is a composite pole, the top portion made of jack pine and the bottom made of concrete, and testing of this design is currently under way.

After the serviceability of several poles has been tested under actual field conditions, the investigators will be able to make specific recommendations on what would be



Experimental solar collector

Solar Heat for Grain Drying

This may be the year when farmers will take advantage of solar heat for grain drying

Poor harvest weather conditions again this year make it likely that much grain will be harvested at moisture contents which are not safe for long term storage Tough grain can be kept over winter if it goes into the bin cool and stays cool, but there will undoubtedly be many hundreds of thousands of bushels of grain that will have to be dried

Heated air driers are now common, but increases in the price of fuel may make it logical to consider using solar heat to warm air for grain drying Weather conditions a year ago were very well suited to this method Much grain was harvested tough and damp in late September, but during the month of October there were many cool, sunny days when a solar heating system associated with a drying fan would have greatly speeded up grain drying while keeping the cost to a minimum

Many types of solar collectors have been devised, but a simple one which is suitable for grain drying consists simply of clear plastic over a dark surface, creating a miniature greenhouse Air drawn through the collector by a large fan is warmed by the heat absorbed on the dark surface Ideally the collector should face directly toward the sun at all times. However, for practical purposes placing it on the ground or on the south wall of a grain bin would produce perfectly adequate results. If the dark surface is made in a series of V shapes (rather like a child's paper fan on a large scale), the angles will permit it to continue to absorb radiation as the direction of the sun changes over the course of the day.

Experiments at the University of Saskatoon show that a solar collector of this shape with an area of 200 square feet will raise the temperature of an airflow of 1,000 cubic feet per minute (cfm) by as much as 20°F on a bright sunny day. On a cloudy but bright day the air would be warmed by about 10°. Even on heavily overcast days a temperature rise of 2° or 3° will occur. You've noticed this effect when you get into a car that has had the windows rolled up on a cloudy day .

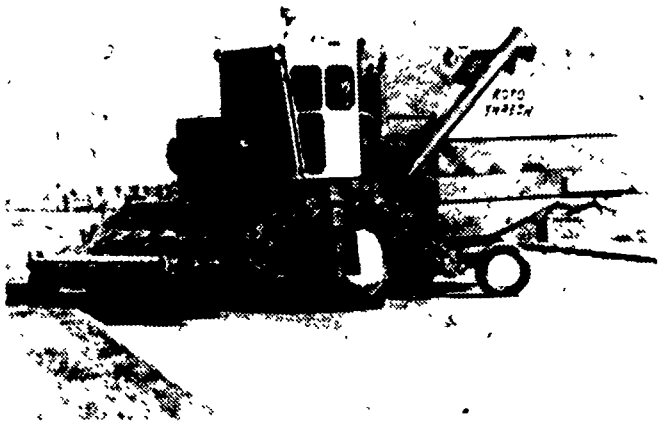
The solar heating system of drying grain is best suited to bulk drying in a bin where an airflow of 2 to 5 cfm per bushel is used. For example, a small system of this type might consist of a grain bin 12 feet by 14 feet, with 5 feet of wheat on a perforated false floor To achieve an airflow rate of 3 cfm per bushel, a fan capable of delivering 2,000 cfm against a pressure of 2 inches of water must be used. In other words, a simple propeller type fan is not suitable, as it is not powerful enough to deliver air against so high a pressure. A fan similar to those used in forced-air furnaces, but larger, is required, operated by a ¾ hp electric motor. A solar collector with an area of 350 square feet would raise the temperature of the air by 10°F. During late September and early October, a drying unit of this type might require four days to reduce the moisture content by 3 per cent If unheated air were used it would take at least twice as long.

A solar grain drying system of this type is not a substitute for a large heated air dryer. These units are capable of drying 100 to 200 bushels per hour, ten times the rate of the solar dryer described above. A solar collector to heat the air for one of these large dryers would have to be so large as to make it impracticeal However, a small solar drying unit such as the one described may be of real benefit to the farmer who has only a few thousand bushels to dry.

For more information one would wirte to the:

College of Engineering Extension
Univeristy of Saskatchewan
Saskatoon
S7N 0W0

3



A Revolutionary Combine Design

by
O L Symes,
College of Engineering

In our short harvest time, farmers need to be able to combine their grain as quickly as possible, without losing grain in the process The traditional reciprocating straw walkers used to separate grain from straw are inefficient at higher feed rates For the past six years, the Department of Agricultural Engineering at the University of Saskatchewan has been studying a method of separation by rotation. We have found it to be more efficient and of greater capacity than straw walkers.

Ideas for separating grain from straw by devices other than the straw walker have been tried for many years Mechanisms incorporating different versions of rotating separators date back in patents to 1885 None proved entirely satisfactory, though many new patents have been issued in the last decade

In 1949, Manitoba farmers Frank McBain, and Bill and Fred Streich devised and put into practice a method of rotary separation using a drum and in 1969 Western Roto-Thresh contracted with the Research and Development section of the University's Department of Agricultural Engineering to analyse the efficiency and prod

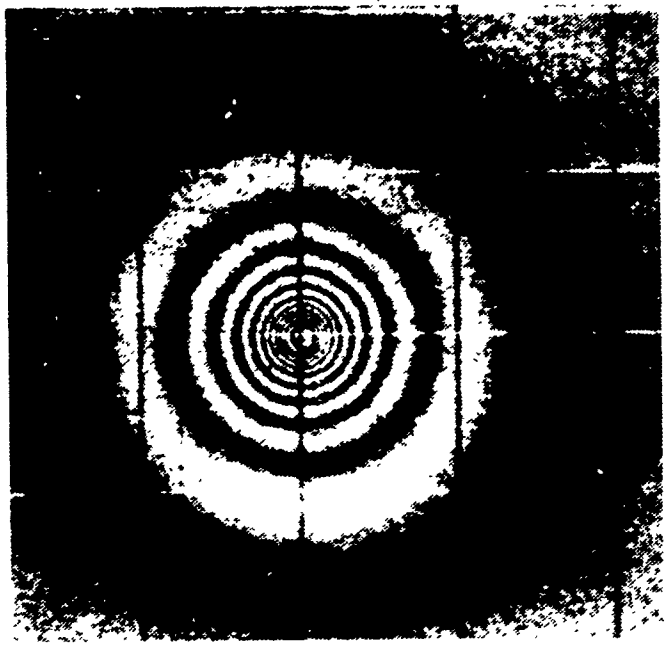
to determine what factors in the design and use of the drum affected its eificiency In the laboratories, we studied the effect of drum diameter on separating efficiency and feed rate, as well as the effect of the drum speed and air flow requirements. We also measured the relationship between drum diameter and drum speed and the effect of straw layer depths in the drum

Our studies indicated that very good separation efficiency was possible with optimum drum speeds and air flow. A 4 foot diameter drum 8 feet in length had higher efficiency than coventional straw walkers used in conjunction with the same sized threshing cylinder Drum diameter was important for high capacity but the actual separation time was less with smaller diameter drums. The same drum can be used for various crops

A number of machtners, called Roto-Thresh combines, were manufactured for use beginning in 1974 The separation drum was found to be capable of separating a grain feed rate of wheat in the range of 500 bushels per hour with a 2% loss from the rotating drum, depending on crop conditions

The research was done by E A Jan, G C Zoerb, W B Reed and F W Bigsby of the College of Engineer

Air Jets Shape Up



The above photographs of the effects of circular and rectangular jets, were taken with an ordinary camera focused on the laser light hologram. Dr. Masliyah and his associates are presently negotiating a possible test application of their discoveries to drying procedures in the pulp and paper industry, using a back panel to control the blow-back of the air playing on the test surface.

By Professor Jacob Masliyah

Air jets are among that multitude of useful mechanical devices that serve us in our daily lives and in industry. They dry our hands, or our hair, clear our windshields, feed our furnaces, keep the mail moving in automatic letter sorting machines, cool molten glass and sheet steel, and dry paper in our mills. Dentists rely on them to ensure that the filling that protects your tooth will have a clean dry surface to adhere to, and airline [illegible] them as part [illegible]

[illegible] scientific knowledge about them since the basic work was done in the late 19th century by O. Reynolds. Four years ago in Edinburgh Professor Jacob Masliyah of the Chemistry and Chemical Engineering Department of the U of S worked with Professor Norman Macleod on a project studying the effects of air jets issuing from circular tubes, the traditional tube shape.

Since coming [illegible] Professor [illegible] comm[illegible]

surprise that although a jet issuing from a circular tube affects a circular area on the surface on which it is played, a jet from a rectangular tube does not affect a rectangular area. It creates an elongated, diamond-shaped pattern on the test surface, indicating that a diamond-shaped area was being affected by the air jet. It was thus also effective over a larger surface area than would have been affected if the air jet had simply issued from a circular tube delivering the air. This simple discovery may have very far-reaching effects in the application of air jets.

In conditions which require an even application of air for drying, heating or cooling, it may be possible to get better results through the careful positioning of rectangular jets. The diamond patterns can be arranged to interlock with a minimum of the overlap required with the more traditional circular pattern, thus achieving a more even effect with a more economical use of equipment. In certain circumstances, as for example in the case of an air jet positioned to clear the rear window of a car, a diamond-shaped patch would provide a wider field of vision than a circular patch would.

Professor Masliyah and his co-workers have developed a precise scale of values for the variation in effect produced by changes in the rate of air flow and distance of the air jet tip from the surface. Their information will enable other researchers to test in a theoretical way the applicability of their work to special conditions, without having to set up complicated and expensive test sites.

Their own work has been on a very controlled scale, using laser beam holography to measure difference of one thousandth of an inch in the test surface. The tiny test station in the Chemistry and Chemical Engineering Department uses a quarter-inch rectangular jet, playing on a flat surface which has been coated in silicon rubber, and soaked in an organic solvent which causes it to [illegible] the solvent e[illegible]

The Indoor Atmosphere and Respiratory Health

5

By Prof. G.H. Green, Department of Mechanical Engineering

An increase of only 10 per cent in the humidity of indoor air can decrease the incidence of respiratory diseases by nearly half in kindergarten children, and by 15 per cent in office workers, according to research conducted by Professor George Green of the Mechanical Engineering Department at the University of Saskatchewan. In cooperation with medical doctors, Professor Green has studied the effects of indoor humidity on respiratory health and absenteeism in Saskatoon and Halifax, and spent last year in Denmark doing further research and experimentation.

According to Professor Green, although food and its effect upon health has been exhaustively studied, the air we breathe has not been studied to anywhere near the same extent, although respiratory diseases, which include the common cold, influenza, pneumonia, etc., are the most common of all health problems. Health surveys in England and the U.S.A. have revealed that they account for from 60 per cent to 80 per cent of all acute conditions.

We spend 95 per cent of our life indoors, so it is the indoor atmosphere that is important to respiratory health. Indoor air is distinctly different from outdoor air. In addition to different temperature and humidity, it has pollutants, particles, and living viruses and bacteria that are different from those in the outdoor air.

The indoor air that we breathe is a complex aerosol containing oxygen, nitrogen, water vapour, solid and liquid particles, pollutants from outdoors, and viruses and bacteria, all of which are held in constant suspension. Engineers have devised means to control these components, but we do not know at what level they should be maintained for optimum respiratory health.

In his investigation of the effects of changes in the relative water vapour content of indoor air, that is of its humidity, in Halifax and Saskatoon, Dr. Green has discovered that increasing the relative humidity in schools by 10 per cent decreased the occurrence of respiratory infection by 10 per cent. Studies in Switzerland have revealed a reduction of respiratory illness as high as 47 per cent in small children in kindergartens and of 15 per cent in office workers, with a 10 per cent increase in relative humidity. Professor Green's studies of respiratory illness in Danish schools had similar results.

It is not yet known whether the humidity has a direct or indirect effect upon respiratory health. However, the evidence of the six studies so far conducted by Dr. Green is convincing enough to suggest that humidity in homes, office buildings, schools, etc., should be maintained as high as possible in winter.

The highest relative humidity maintained in the experiments was 50 per cent, which also appears to be the optimum level for maintaining respiratory health so far tested. The lowest relative humidity tested was 22 per cent, and it was found that every experiment which raised the humidity above that, up to the maximum level tested, resulted in a reduction in respiratory illness.

Professor Green stresses that the limit to the humidity is set by the building. Too high a humidity can cause damaging window and interior wall condensation. At outdoor temperatures of minus 30°C the highest relative humidity that can safely be maintained indoors is about 35 per cent. The indoor relative humidity must be lowered as outdoor temperature drops because wall and window surfaces become colder, but the indoor humidity should always be kept as high as possible.

Since returning to Saskatoon Professor Green is continuing his studies of the effect of indoor environments upon respiratory health with studies of how humidity influences the other components of indoor air.

For more information write:
College of Engineering
Extension
Box 22
University of Saskatchewan
Saskatoon, Saskatchewan
S7N0W0

Experimental Solar Collector

Reduced Fuel Bills Using Solar Energy

by
R W Besant and
G J Schoenau
College of Engineering

Saskatchewan has very cold, but very sunny, winters Professors R W Besant and G J Schoenau of the Mechanical Engineering Department at the University of Saskatchewan believe that, in our climate, solar preheating of the ventilation air intake in hot air heating systems can be a practical method of offsetting rising fuel costs They have been experimenting over the past year, in winter and summer conditions, with a simple solar preheater, capable of feeding preheated air directly into a hot air heating system through a simple fan attachment Heating of the ventilating air can account for as much as 30% of the total heating requirement for a building The results of their study indicate that practical savings can be achieved, and a wide variety of applications developed, from a relatively simple and inexpensive solar preheating unit

For a capital cost of between $60 and $70 they constructed a test unit of plastic, wood and metal eight feet long by four feet wide The heater was constructed of black galvanized iron to absorb [illegible] sun, protected by [illegible] covering [illegible] tak[illegible]

Such a unit could be mounted on a south-facing roof, or on a vertical wall A vertical wall would not only eliminate snow clearing problems but would be more efficient than most roofs. At our latitude, an angle of 70° from the horizontal is the most efficient for maximum insolation. Most roofs are on a shallower angle than this, being around 30 from the horizontal, so a vertical wall, at 90 from the horizontal, would be closer to the optimum angle Early morning frost accumulation could be a problem under some circumstances, but this could be avoided by using a removable night cover sheet No special ducting or fan equipment would be required, as the air could feed directly into the air intake area or to the furnace through the wall and the furnace air intake would be sufficient to generate the air flow required

Saskatoon Research Council figures published over the last few years show that Saskatoon for example, is one of the sunniest cities in Canada, with 2405 hours of clear sunlit sky out of a maximum of 4506 hours of possible direct [illegible] During the seven mo[illegible] significant heat[illegible] Saskatoon, a[illegible] Research [illegible] there[illegible]

puter projection of the savings possible with the small test unit indicate that, allowing for a ten percent interest on the capital costs and no rise in fuel costs, it would have paid for itself in one year if attached to an electrical heating system, in four years with propane, nine with fuel oil, and 22 years with natural gas. The engineers estimate that with the present trends in natural gas cost increases, the 22-year period could drop to less than five years. After that it would be pure saving.

The applications of solar preheating unit are not restricted to residential purposes Any building using air for heating — barns, commercial buildings, schools, curling rinks — could be economical to heat if the air coming into the system were preheated Heating swimming pools is another possible application envisaged by Dr. Schoenau and Professor Besant

Solar heating applications will likely become widespread throughout many parts of Canada as the cost of other fuels rise It has be[illegible] [illegible]mated that some [illegible] heating [illegible] te[illegible]

100 Deaths Per Year, The Cost of Not Using Safety Belts

7

Up to 100 lives are needlessly lost in Saskatchewan each year because some people refuse to use the safety belts available in their cars. This is one of the findings of studies carried out by the University of Saskatchewan Transportation Centre during the past two years. The studies, funded by the Federal Ministry of Transport documented the effectiveness of safety belts as a means of reducing deaths and injuries in traffic accidents. In comparing the injuries sustained by accident victims who were wearing safety belts with those of victims who weren't

One of the principal findings from the Transportation Centre study was that there are basically four ways in which victims of auto crashes may be injured. The greatest number of injuries occur when the vehicle occupants do not stop with their vehicles. When a vehicle collides with another vehicle or whatever it does not stop immediately. The crumpling of the vehicle [illegible] and frame

However, unrestrained passengers are not able to take advantage of the several inches of cushion provided by the crumpling of the vehicle's fenders and frame. Instead of slowing down and stopping with the vehicle, they continue to move forward at the pre-impact speed until they strike some portion of the vehicle interior such as the hard surface of the dash or windshield, the steering wheel or the back of the front seat. By the time they strike these surfaces, the vehicle will be almost stopped, and their impact may be many times higher than if they had been wearing safety belts and stopped with the vehicle.

The second source of injury comes from other unrestrained persons or objects in the car. For example, in serious head on collisions rear seat passengers are thrown forward with forces of several thousand pounds crushing front seat passengers against the dash and windshield. This added force can often spell the difference between life and [illegible] front seat [illegible]

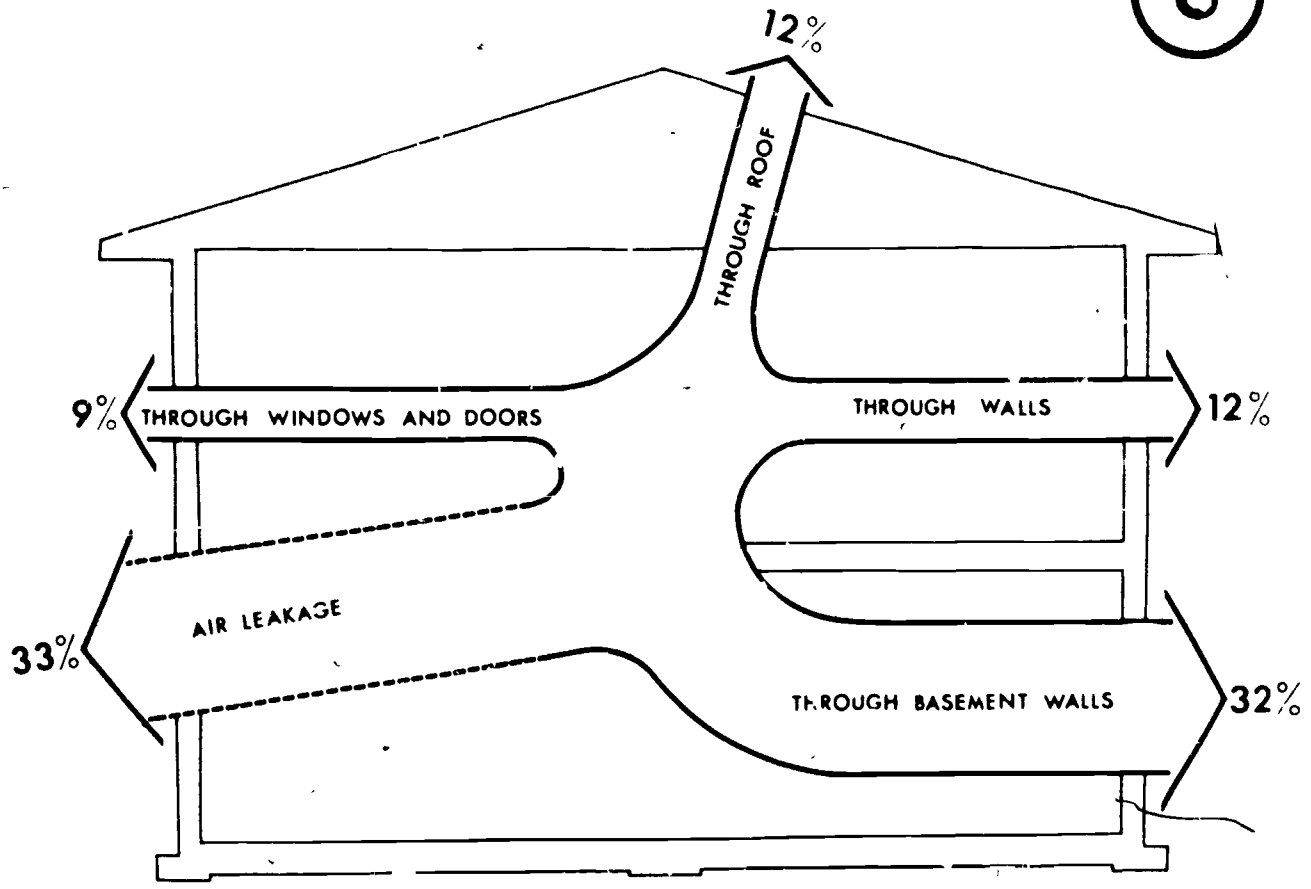
most common in rollover accidents. In even low speed rollovers, the forces tending to throw a person out through the window can be several thousand pounds. Safety belts are the only things strong enough to resist these large forces. About 30 persons were killed in Saskatchewan during 1974 when they were ejected and crushed. None of these would have been seriously injured if they had been wearing the safety belts that were in their cars.

In some rollover accidents, persons are only partially ejected. In these cases broken backs and broken necks are very common. Such victims, if they live, are often paralyzed from the waist down or from the neck down.

The fourth injury source, and the only one which safety belts can not prevent, is penetration of the passenger compartment. If some part of the vehicle or object struck enters the passenger compartment and penetrates or eliminates the space in which a person is sitting, then serious or fatal injuries will result. In these cases, safety belts will neither help nor hinder. Approximately 30 percent of all automobile fatalities result from penetration of the passenger compartment. This means that safety belts can eliminate up to about 70 percent of the fatalities which occur in car crashes.

In addition, the Transportation Centre study found that the risk of serious injury is reduced by approximately 80 percent with the use of safety belts. If all persons were to use the safety belts in their cars, the savings would be substantial. In Saskatchewan, for example, approximately 100 lives would be saved each year. In addition, several millions of dollars in medical and rehabilitative costs would be eliminated. Nationally, these savings would amount to approximately 2,000 lives annually and hundreds of millions of dollars in health care costs.

The study concluded that increasing [illegible] belts is [illegible] effective [illegible] loss [illegible]



Energy Conservation in Existing Houses

By H W Orr.
National Research Council

Homeowners in Canada could save up to 20% of their heating costs by improving basement insulation alone. In a typical bungalow, heated by a gas or oil-fired furnace, 32% or nearly one-third of the heat that doesn't go up the chimney goes out through the basement wall. Mr. H.W. Orr of the National Research Council establishment of the University of Saskatchewan campus calculates that at current costs for energy and insulation, it appears that increasing basement insulation to the new standard set by the Central Mortgage and Housing Corporation (CMHC) would pay for itself in three years, with even greater future savings to be expected as fuel prices continue to rise.

In Saskatchewan, the Saskatchewan Power Corporation has recently increased natural gas costs to consumers 47% and electricity Very

the ground. Insulating materials now on the markets are rated according to their thermal resistance, or insulating capacity. The "R" numbers relate a measure of the amount of heat the material keeps in, so that the consumer can readily compare the insulating value of a number of different materials. The higher the thermal resistance number, the less heat the material will let through, so an insulating material with a thermal resistance of R12 has twice the insulating capacity of a material with a thermal resistance of R6.

In a house already constructed, with uninsulated cast-in-place concrete basement walls, the new CMHC standard of R8.4 can be obtained by adding insulation having a thermal resistance of at least R7, or the equivalent of approximately two and one-half inches of mineral fiber insulation. If the walls have been finished, but must be pulled up to stand the insu

place, and where investment can be considered.

Air leakage, or air infiltration as it is technically called, also accounts for approximately one-third of the heat loss in the average bungalow. The degree of control over the air movement into and out of a house depends in a large part on the complexity of the mechanical systems in the house, and on the air-tightness of the outer shell of the house. Some portion of the ventilating air required for freshness, humidity control and combustion is usually supplied by fresh air ducts, and exhausted by exhaust fans and chimney. However, most of the air exchange is directly through the outer shell, and is thus controlled by the degree to which the outer shell is air-tight. The air-tightness of the outer shell varies a great deal from house to house, and can only be increased by sealing a

constitute a large energy loss. If high humidity levels are to be achieved, the air-tightness and insulation of the structure must first be assured.

With typical walls, doors and windows, through which a total heat loss of slightly over 20% takes place, it is very difficult to reduce heat losses economically. The addition of triple glazing costs more than the savings in fuel can justify at present. Unless a wall is completely without insulation, the cost of placing additional insulation in the existing wall may prove uneconomic. The upgrading of attic insulation, to reduce the typical heat loss through the roof of 12% is usually much more easily achieved. If there is less than two inches of insulation provided in the attic, the cost of additional insulation to the 1975 CMHC standard of R20 will be amortized by a period of

Flood Control in Meandering Streams

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By Prof. C.D. Smith, College of Engineering

The causes of high flood levels on some prairie streams have been under study by the Civil Engineering Department of the University of Saskatchewan. Most prairie rivers like the Assiniboine, the Carrot, the Qu'Appelle and Moose Jaw rivers, and the Waseana Creek, have meandering low water channels which wander back and forth across the river valleys in exaggerated S-shaped courses. With a straight and uniform river channel it is possible to calculate fairly accurately the stage or water level likely to be reached at various sites along the river for a given discharge or rate of flow, but it has not been known exactly what effect the meandering channels typical of the prairies have in flood conditions.

The U of S studies have shown that in high flood conditions when the water spills out over the banks of the normal river channel and spreads out in the river valley itself, the meandering channel actually creates a resistance to the discharge of the flood waters, causing a back-up effect and higher water levels for the same rate of flow than would be the case with rivers with uniform, straight channels.

This information will have important consequences for predicting flood levels during the spring run-off period, and for the design of flood control methods in prairie rivers.

To simulate river conditions a hydraulic model of a meandering channel was constructed in the Hydraulics Laboratory of the Engineering Building. A section of the model is shown in the accompanying photo. The low water channel in the model was three inches deep, five inches across at the bottom and 11 at the top, and was laid out in an S-shaped meander pattern in a flume four feet wide.

Using dyes to observe flow patterns the engineers found that the meandering channel created complex currents and cross currents in the flooded valley. At low flood levels the channel still contributed to some extent in carrying off water, but at higher levels parts of the channel actually became stagnant while the flood waters passed over them. At a "flood" stage of five inches above the bed of the low water channel in the model it was found that due to turbulence and cross currents created by the meandering channel, the flood level was actually higher than those created with the same rate of discharge with the channel filled in. In an actual river situation resistance effects may also be produced by the presence of brush and trees along the river banks, and by natural irregularities along the bank and in the channel itself, such as potholes or boulders. In addition, in some rivers the meanders are so exaggerated that the river appears almost to double back on itself, and frequently has sections of the river running at right angles to the general direction of the valley. The U of S engineers also constructed a model of a river with exaggerated meanders and simulated riverbank vegetation, and found that resistance effects for this type of channel were even more pronounced.

The new information has important implications for planning flood control measures. It is well known that straightening channels and clearing channels and banks of obstructions will greatly increase the carrying capacity of the channel during flood conditions. The study gives an indication of the improvement that can be expected. It is also important information for those attempting to estimate high water levels in fighting floods, as the resistance effect of S-shaped river channels can create higher levels than would otherwise be expected. The Civil Engineering Department plans further analysis of their data later this summer.

For more information write:
College of Engineering
Extension
Box 22
University of Saskatchewan
Saskatoon, Saskatchewan
S7N 0W0

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Automatic Controls for the Combine

By J.N. Wilson and G.J. Schoenau

Is it possible to develop a self-regulating combine? Professors J N Wilson and G J Shoenau of the College of Engineering in Saskatoon are working on developing a combine fully equipped with its own sensing system, to take the guesswork out of the many adjustments the operator must make in the field to get his harvest off in the minimum time with the minimum loss of grain

The modern combine is one of the more complex machines on the farm Most of these machines are equipped with controls which enable the operator to adjust many of the combine settings, such as concave clearance and cylinder speed, while the machine is running Adjustment of these settings to obtain maximum efficiency under varying crop conditions is difficult, even for the most skilled operator

The grain loss monitor was the first step in taking the guesswork out of combining Developed in the Department of Agricultural Engineering under the direction of W B Reed, Research Officer, it was first marketed in 1968 and is now used around the world for harvesting everything from rice in Alabama to barley in Britain

The monitor consists of a sensing unit installed beneath the rear of the straw walkers and sieves and a meter located in front of the operator Only grain not separated on the walkers and sieves is sensed by the special unit, which does not respond to chaff or straw Grain sensed by the unit is converted into a meter reading by transistorized electronic circuitry If the meter reading gets too high, the operator can slow the forward speed of his machine and reduce his grain loss

But the forward speed of the combine is not the only control that the operator has to worry about, and loss of grain over the straw walkers is not the only factor affecting harvesting success. Losses are also affected by other settings such as cylinder speed, concave opening, fan speed and sieve opening, as well as crop conditions, such as grain to straw ratio and moisture content

The Division of Control Engineering at the University of Saskatchewan is attempting to develop an automatic control system that will continually adjust ground speed, as well as these other machine settings to maintain optimum efficiency under all crop conditions and machine throughputs The first phase in the development of this control system will be to obtain a better understanding of the dynamics of a combine. To accomplish this, Professor Greg Schoenau and Doug Campbell of the Mechanical Engineering Department have instrumented a combine with sensors to measure material flow into the combine, threshing cylinder torque, grain loss over the walkers and sieves, ground speed, grain flow into the tank and the flow of material returned to the cylinder for rethreshing Field tests are being conducted to collect data from these sensors under actual harvesting conditions and with different machine settings The results will be used to evaluate the sensors and to develop a computer model of the combine It is hoped that this model, together with adequate sensors, will eventually allow the design and implementation of a control system which will automatically vary the settings in such a manner as to optimize the efficiency of the combine

School Bus Safety - Is It A Problem?

A.C. Shiels, Director
Transportation Centre,
College of Engineering

More than 75,000 children are transported on school buses each day in Saskatchewan. This makes school busing the largest public transportation system in the province. But just how safe is this transportation system? This is the subject of a study currently being carried out by the University of Saskatchewan Transportation Centre under a contract awarded by the Saskatchewan Traffic Board

The study, which is expected to be complete by September of 1976, is attempting to assess the level of safety inherent in all aspects of the transportation of school children in school buses. Vehicle maintenance, standards for training and licensing of school bus operators and the regulations governing the operation of school buses are some of the aspects to be considered

So far, the study has found that there have been approximately 65 school bus accidents per year during the past two years. In 1974 there were 22 injuries and no fatalities, while in 1975 there were 56 injuries and two f
Considering that
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other area to be studied. During the past two years, at least six of the school bus accidents were a direct result of mechanical failures. The need for improved vehicle inspection programs will therefore be assessed by the study.

Although methods to reduce the number of accidents will form a large portion of the study, it is recognized that some accidents will occur. Therefore ways to reduce injuries in accidents will also be studied. High on the list of countermeasures to be considered is the provision and use of safety belts by all school bus operators. The reasons for such a measure are two fold (1) Since the driver is often the only adult available to attend to the children following a crash, it is essential that the driver be protected as much as possible. (2) It helps the driver remain in his or her seat and in control of the bus following minor collisions, on rough roads, or if the bus leaves the road

Another countermeasure being studied is the cost and practicability of fitting the exposed metal frames of the seats on older buses with padding In
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Minicomputers and Microprocessors

By
A. R. Boyle, College of Engineering

Minicomputers and microprocessors are now becoming part of the general life of the community. These are not the large and expensive machines found in the air-conditioned rooms of computer centres. Rather they appear in the desks of "intelligent" typewriters, control the air conditioning of large buildings, direct the flight paths of aircraft, monitor power stations, and tally the purchases at the neighbourhood supermarket. However, our lives are not, and never will be, ruled by these devices. They are electronic slaves to do tedious work untiringly, and do it more rapidly, more accurately and more comprehensively than ever before.

The Electrical Engineering Department at the University has been building up expertise in these areas, partly with the aim of properly informing students of the latest developments, but also to provide a service of knowledge and ability in the application of these devices. Which device should be used for a particular job? What methods could in fact be applied to a user's problem? How does the user get assistance with programming and implementation?

A minicomputer is a general purpose device or "black box" which can now be made at low cost on production lines, to produce a highly reliable although complex product. How it is used depends on the programs written for it and much effort has been put into this work. It is the harmonious mixture of the equipment and the programs (hardware and software) which makes an applicable unit.

In many
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or even maps. This work is an extension of the present ability of the human mind in memory and pictorial understanding, just as earlier engineering developments have increased the strength or speed of movement of a human being. It has important applications in environmental impact studies, land use surveys and many complex decision-making operations.

In the Mechanical Engineering Department, minicomputers are used to monitor engine performance, analysing the data to produce meaningful information. In the Division of Hydrology, they are used to analyse the water flow and rainfall from a number of test situations and to coordinate and compare the results.

Such developments are, perhaps more suitable to a University environment as part of its advanced research, but the knowledge built up during this work enables our engineers also to design even such devices such as the lighting control for a dance hall or the elevator control in a multi-storey hotel. More and more production shops will find the need for such minicomputer control in order to provide more flexibility in its product line, a faster response to requests and most importantly of all, an advantage financially.

There are exciting developments in the new very low cost microprocessors which perform many of the functions of the minicomputer, and are now being incorporated in such mundane things as household appliances.

If you are involved in a profession, business or industrial management or government
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APPENDIX B

ARTICLE READERSHIP DATA

PAPER NO. 1 ONLY (N = 99)

Item	Article Headline	Mean	S.D.	Valid N	Percentage Responding: All or most	Read Some	Didn't Read	Didn't See
1	New Power Poles	2.766	1.299	94	27.3	11.1	13.1	43.4
2	Solar Heat for Grain Drying	2.543	1.224	94	28.3	17.2	19.2	30.3
3	Revolutionary Combine Design	2.255	1.244	94	38.4	19.2	12.1	25.3
4	Air Jets Shape Up	3.370	0.980	92	7.1	12.1	13.1	60.6
5	Indoor Atmosphere and Respiratory Health	2.747	1.229	95	21.2	23.2	10.1	41.4
6	Reduced Fuel Bills Using Solar Energy	2.538	1.221	93	26.3	22.2	14..	31.3
7	100 Deaths Per Year, The Cost of Not Using Seat Belts	1.916	1.078	95	45.5	27.3	9.1	14.1
8	Energy Conservation in Existing Homes	2.495	1.256	93	29.3	21.2	11.1	32.3
9	Flood Control in Meandering Streams	3.202	1.093	94	12.1	12.1	15.2	55.6
10	Automatic Controls for the Combine	3.022	1.216	93	19.2	10.1	14.1	50.5
11	School Bus Safety--Is It A Problem	2.126	1.178	95	41.4	20.2	15.2	19.2
12	Minicomputers and Micro-processors	3.404	1.009	94	9.1	9.1	11.1	65.7
	MEAN	2.698	1.168	93.8	25.4	17.1	13.1	39.1

APPENDIX B

ARTICLE READERSHIP DATA

PAPER NO. 2 ONLY (N = 45)

Item	Article Headline	Mean	S.D.	Valid N	Percentage Responding: All or Most	Read Some	Didn't Read	Didn't See
1	New Power Poles	2.614	1.351	44	33.3	13.3	8.9	42.2
2	Solar Heat for Grain Drying	2.116	1.179	43	40.0	24.4	11.1	20.0
3	Revolutionary Combine Design	2.186	1.367	43	48.9	11.1	4.4	31.1
4	Air Jets Shape Up	3.605	0.821	43	4.4	6.7	11.1	73.3
5	Indoor Atmosphere and Respiratory Health	2.818	1.263	44	22.2	20.0	8.9	46.7
6	Reduced Fuel Bills Using Solar Energy	2.295	1.268	44	37.8	22.2	8.9	28.9
7	100 Deaths Per Year, the Cost of Not Using Seat Belts	2.114	1.280	44	48.9	13.3	11.1	24.4
8	Energy Conservation in Existing Homes	2.648	1.389	43	31.1	15.6	48.9	4.4
9	Flood Control in Meandering Streams	3.419	1.096	43	13.3	4.4	6.7	71.1
10	Automatic Controls for the Combine	3.114	1.243	44	20.0	8.9	8.9	60.0
11	School Bus Safety--Is It A Problem	2.477	1.229	44	31.1	17.8	20.0	28.9
12	Minicomputers and Microprocessors	3.614	0.920	44	8.9	2.2	6.7	80.0
	MEAN	2.755	1.200	43.6	28.3	13.3	13.0	42.6

APPENDIX B

ARTICLE READERSHIP DATA

PAPER NO. 3 ONLY (N = 184)

Item	Article Headline	Mean	S.D.	Valid N	Percentage Responding			
					All or Most	Read Some	Didn't Read	Didn't See
1	New Power Poles	3.039	1.209	178	17.9	14.7	9.8	54.3
2	Solar Heat for Grain Drying	2.542	1.242	179	28.3	22.3	12.5	34.2
3	Revolutionary Combine Design	2.458	1.295	179	35.3	15.8	12.5	33.7
4	Air Jets Shape Up	3.353	0.969	173	7.1	12.0	15.8	59.2
5	Indoor Atmosphere and Respiratory Health	2.820	1.258	178	22.3	19.6	8.2	46.7
6	Reduced Fuel Bills Using Solar Energy	2.315	1.227	178	34.8	23.9	10.9	27.2
7	100 Deaths Per Year, The Cost of Not Using Seat Belts	1.972	1.162	181	48.4	23.4	7.6	19.0
8	Energy Conservation in Existing Homes	2.434	1.243	175	31.0	22.3	11.4	30.4
9	Flood Control in Meandering Streams	3.403	0.992	176	8.2	10.9	10.9	65.8
10	Automatic Controls for the Combine	3.022	1.213	179	19.6	11.4	13.6	52.7
11	School Bus Safety--Is It A Problem	2.531	1.264	179	31.0	17.9	14.1	34.2
12	Minicomputers and Microprocessors	3.517	0.891	174	5.4	9.2	10.9	69.0
	MEAN	2.782	1.163	177.4	24.1	17.0	11.5	43.9

APPENDIX C

SUMMARY OF TWO-WAY ANALYSIS OF VARIANCE

Source	S.S.	d.f.	M.S.	F	p
Between Subjects	2376.641	327			
(A) Newspaper Affiliation	.958	2	0.479	0.066	0.937
Subjects Within Groups	2375.090	325	7.308		
Within Subjects	4437.750	3608			
(B) Articles	623.888	11	56.717	56.808	0.000
(A) x (B) Interaction	36.635	22	1.665	1.668	0.026
(B) x Subjects Within Groups	3569.281	3575	0.998		

APPENDIX D

INTER-NEWSPAPER ANALYSES OF VARIANCE AND SCHEFFÉ TESTS ON DEMOGRAPHIC VARIABLES[1]

VARIABLE	BETWEEN GROUPS[1]		WITHIN GROUPS			TOTAL		F	F PROB.	MEANS FOR PAPER		
	S.S.	M.S.	S.S.	d.f.	M.S.	S.S.	d.f.			1	2	3
Sex	0.2797	0.1395	70.2595	311	0.2259	70.5386	313	0.618	0.545[2]	1.6404	1.6632	1.7317
Age	16.3750	8.1875	736.7266	321	2.2951	753.1016	323	3.567	0.029[2]	3.7907	4.0816	4.4098
Residence	9.7542	4.8771	509.7771	319	1.5980	519.5312	321	3.052	0.047	1.9767	2.3265	2.4972
Yrs. of Schooling	3.1797	1.5898	1611.5625	311	5.1819	1614.7422	313	0.307	0.740	9.8125	9.9792	10.0714
Yrs. Higher Education	11.1116	5.5558	272.1436	99	2.7489	283.2551	101	2.021	0.136	2.2500	2.9032	2.9333

[1] d.f. = 2

[2] Scheffé test indicates no significant differences among all pairs of means.

APPENDIX E

DEMOGRAPHIC DATA,
ALL PAPERS COMBINED

N = 328

CHARACTERISTIC	CATEGORY	PERCENTAGE OF RESPONSES	VALID N
Se	Male Female	32.6 63.1	314
Age	Under 20 21-30 31-40 41-50 51-60 Over 60	2.4 15.5 16.8 14.3 21.6 28.0	324
Place of Residence	Farm Town < 500 Town 500-1000 Town > 1000	36.3 20.1 10.4 31.4	322
Highest Grade in School	2 3 4 5 6 7 8 9 10 11 12	0.3 1.2 1.5 1.8 2.7 3.0 18.3 7.3 13.7 8.8 36.3	312
Years of Post-secondary Education	1 2 3 4 5 6 7 8 None or no Response	10.4 9.1 3.4 4.0 2.4 0.9 0.3 0.6 68.9	328

APPENDIX E

DEMOGRAPHIC DATA
PAPER NO. 1 ONLY (N = 99)

CHARACTERISTIC	CATEGORY	PERCENTAGE OF RESPONSES	VALID N
Sex	Male Female	32.3 63.6	95
Age	Under 20 21-30 31-40 41-50 51-60 Over 60	3.0 19.2 16.2 16.2 17.2 27.3	98
Place of Residence	Farm Town < 500 Town 500-1000 Town > 1000	34.3 23.2 16.2 25.3	98
Highest Grade in School	2 3 4 5 6 7 8 9 10 11 12	0.0 2.0 3.0 2.0 1.0 4.0 14.1 3.0 19.2 9.1 39.4	96
Years of Post-Secondary Education	1 2 3 4 5 6 7 8 None or no response	11.1 4.0 4.0 7.1 2.0 1.0 1.0 1.0 68.7	99

APPENDIX E

DEMOGRAPHIC DATA
PAPER NO. 2 ONLY (N = 45)

CHARACTERISTIC	CATEGORY	PERCENTAGE OF RESPONSES	VALID N
Sex	Male Female	24.4 66.7	41
Age	Under 20 21-30 31-40 41-50 51-60 Over 60	2.2 22.2 20.0 13.3 24.4 13.3	43
Place of Residence	Farm Town < 500 Town 500-1000 Town > 1000	53.3 15.6 2.2 24.4	43
Highest Grade in School	2 3 4 5 6 7 8 9 10 11 12	0.0 0.0 0.0 0.0 2.2 4.4 24.4 8.9 4.4 11.1 37.8	42
Years of Post-secondary Education	1 2 3 4 5 6 None or No Response	11.1 6.7 2.2 4.4 4.4 4.4	45

APPENDIX E

DEMOGRAPHIC DATA
PAPER NO. 3 ONLY (N = 184)

CHARACTERISTIC	CATEGORY	PERCENTAGE OF RESPONSES	VALID N
Sex	Male	34.8	178
	Female	62.0	
Age	Under 20	2.2	183
	21-30	12.0	
	31-40	16.3	
	41-50	13.6	
	51-60	23.4	
	Over 60	32.1	
Place of Residence	Farm	33.2	181
	Town < 500	19.6	
	Town 500-1000	9.2	
	Town > 1000	36.4	
Highest Grade in School	2	0.5	174
	3	1.1	
	4	1.1	
	5	2.2	
	6	3.8	
	7	2.2	
	8	19.0	
	9	9.2	
	10	13.0	
	11	8.2	
	12	34.2	
Years of Post-secondary Education	1	9.8	184
	2	12.5	
	3	3.3	
	4	2.2	
	5	2.2	
	6	0.0	
	7	0.0	
	8	0.5	
	None or No Response	69.6	

APPENDIX F

FACTOR ANALYS ESULTS

VARIABLE	ESTIMATED COMMUNALITY	FACTOR	EIGENVALUE	PERCENT OF VARIANCE	CUMULATIVE PERCENT
New Power Poles	0.26268	1	4.44136	37.0	37.0
Solar Heat for Grain Drying	0.49355	2	1.26533	10.5	47.6
Revolutionary Combine Design	0.43036	3	1.21098	10.1	57.6
Air Jets Shape Up	0.25894	4	0.82693	6.9	64.5
Indoor Atmosphere and Respiratory Health	0.38793	5	0.74401	6.2	70.7
Reduced Fuel Bills Using Solar Energy	0.49877	6	0.70511	5.9	76.6
100 Deaths Per Year, The Cost of Not Using Seat Belts	0.34214	7	0.59859	5.0	81.6
Energy Conservation in Existing Homes	0.39632	8	0.56097	4.7	86.3
Flood Control in Meandering Streams	0.31963	9	0.48179	4.0	90.3
Automatic Controls for the Combine	0.37980	10	0.44405	3.7	94.0
School Bus Safety--Is It A Problem?	0.32379	11	0.41557	3.5	97.5
Minicomputers and Micro-processors	0.32132	12	0.30527	2.5	100.0

APPENDIX F (cont.)

Factor Matrix Using Principal Factor With Iterations

Variable	Factor 1	Factor 2	Factor 3	Communality
New Power Poles	0.50093	-0.14533	0.12129	0.28676
Solar Heat for Grain Drying	0.63152	-0.31562	-0.16873	0.52690
Revolutionary Combine Design	0.60266	-0.48104	0.07757	0.60061
Air Jets Shape Up	0.41824	0.30663	0.28856	0.35222
Indoor Atmosphere and Respiratory Health	0.60110	0.25832	-0.15075	0.45077
Reduced Fuel Bills Using Solar Energy	0.67036	-0.04963	-0.29882	0.54113
100 Deaths Per Year, The Cost of Not Using Seat Belts	0.53912	0.16852	-0.25864	0.38595
Energy Conservation in Existing Homes	0.63072	0.15692	-0.06956	0.42727
Flood Control in Meandering Streams	0.55321	0.05764	0.26835	0.38137
Automatic Controls for the Combine	0.59378	-0.24742	0.17961	0.44605
School Bus Safety--Is It A Problem?	0.51764	0.25810	-0.23148	0.38815
Minicomputers and Micro-processors	0.52814	0.19571	0.41150	0.48656

Factor	Eigenvalue	Percent of Variance	Cumulative Percent
1	3.89252	73.8	73.8
2	0.73783	14.0	87.8
3	0.64340	12.2	100.0

APPENDIX F (cont.)

Varimax Rotated Factor Matrix

Variable	Factor 1	Factor 2	Factor 3
New Power Poles	0.17717	0.43064	0.26442
Solar Heat for Grain Drying	0.37561	0.62040	0.03038
Revolutionary Combine Design	0.12776	0.75342	0.12903
Air Jets Shape Up	0.20787	0.03826	0.55457
Indoor Atmosphere and Respiratory Health	0.58776	0.15156	0.28696
Reduced Fuel Bills Using Solar Energy	0.59711	0.42397	0.06958
100 Deaths Per Year, The Cost of Not Using Seat Belts	0.58035	0.17540	0.13556
Energy Conservation in Existing Homes	0.51099	0.25622	0.31703
Flood Control in Meandering Streams	0.20100	0.31505	0.49164
Automatic Controls for the Combine	0.15497	0.57259	0.30688
School Bus Safety--Is It A Problem	0.58709	0.09401	0.18611
Minicomputers and Micro-processors	0.15088	0.20295	0.65009